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Interface Requirements Document Between the Earth Observing System (EOSDIS) Core System (ECS) and the Data Assimilation System (DAS) for the ECS Project

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Goddard Space Flight Center
Greenbelt, Maryland

Interface Requirements Document Between the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) and the Data Assimilation System (DAS) for the ECS Project

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Preface

An earlier version of this document (219-CD-029-001, December 1996) was withdrawn from the ESDIS Document Review process to efficiently include comments received from the Data Assimilation Office in the original version (219-CD-029-002) of this document.

This document is a contract deliverable with an approval code 2. As such, it does not require formal Government approval, however, the Government reserves the right to request changes within 45 days of the initial submittal. Once approved, contractor changes to this document are handled in accordance with Class I and Class II change control requirements described in the EOS Configuration Management Plan, and changes to this document shall be made by document change notice (DCN) or by complete revision.

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Abstract

The Earth Observing System Data and Information System (EOSDIS) Core System (ECS) involves the collection and distribution of data from space and ground based measurement systems to provide the scientific basis for understanding global change. Using ECS as their window to the EOSDIS, the world wide science community is able to access data from a distributed archive in the United States and from international Earth Science support systems. To accomplish this mission, it is necessary for ECS to interface to a wide variety of external systems. This document presents the requirements to provide an interface between ECS and the Data Assimilation System (DAS) managed by the Data Assimilation Office (DAO) at the Goddard Space and Flight Center (GSFC).

The ECS contractor team used the process described in the ECS Methodology for Definition of External Interfaces document to develop these interface requirements. Memoranda of Understanding (MOUs), the Earth Science Data and Information System (ESDIS) Project—Level 2 Requirements, and the Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (the ECS Level 3 requirements document) were used in the methodology to evolve this formal Interface Requirements Document (IRD).

Keywords: DAAC, DAO, DASCE, DRP, ECS, interface, IRD

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1. Introduction

1.1 Identification

This Interface Requirement Document (IRD), Contract Data Requirement List (CDRL) item 039, whose requirements are specified in Data Item Description (DID) 219/SE1, is a required deliverable under ECS, Contract (NAS5-60000). It defines the functional and performance interface requirements between ECS and the Data Assimilation System Computing Environment (DASCE).

1.2 Scope

This document is intended to conform to the terms and conditions of the ECS/DAS interface requirements as documented in the MOU between the ESDIS project and the DAO. The DAS products referenced in this IRD conform to the Technical Baseline for the ECS project, as of February, 1996. This IRD will be updated if any changes to the ECS Technical Baseline results in a change to the interface between the ECS and the DASCE.

This IRD documents requirements for two separate interfaces between the ECS and the DASCE; the first one for supplying to the DAS any data that is archived by the ECS, and the second for ingesting standard DAS products into the ECS.

a. The first interface facilitates transfer of data from the ECS to the DASCE through the Data Reduction Platform (DRP) of the DASCE via the ECS user services (see section 3.2.1). For establishing the requirements for this interface, the interface boundary between the ECS and the DASCE is the point at which the DRP is connected to the ECS Local Area Network (LAN).

b. The second interface facilitates the ingest of standard DAS products into the ECS using the DAO provided network connection (TBD). For the purpose of establishing the requirements for this interface, the interface boundary between the ECS and the DASCE is a DAO provided router that connects the ECS to the DAO provided network connection (TBD).

The scope of this IRD is limited to these two above mentioned interfaces.

1.3 Purpose and Objectives

This document is written to formalize the interpretation and precise understanding of the above mentioned two interfaces between ECS and the DASCE. For ECS, this document provides a clarification and elaboration of the ECS/DAS interface requirements from the Functional and Performance Requirements (Level 3) for ECS. It is meant to stand alone as a total document and contains more detail in regards to interface requirements than a Level 3 requirements specification. The objective of this document is to provide a focus for defining a related Interface

Control Document (ICD) which is being jointly developed by the ECS contractor and the DAO to cover each system interface identified in this IRD.

The ESDIS Project has joint responsibility with the DAO for the development and maintenance of this IRD. Any changes in the interface requirements must be agreed to by the relevant participating parties, and then assessed at the joint ESDIS Project (ESDISP) and the DAO levels. This IRD will be approved under the signature of the ESDISP Manager and the Head of the DAO.

1.4 Status and Schedule

This document is submitted to the ECS Configuration Control Board (CCB) as a final IRD. This document will be under full Government CCB control. As a formal contract deliverable with approval code 1, this document requires Government review and approval prior to acceptance and use. Changes may be submitted for consideration by Contractor and Government Configuration Control Boards (CCBs) under the normal change process at any time.

1.5 Document Organization

This Interface Requirements Document is organized as described below:

Section 1 Introduction - Introduces the IRD's scope, purpose, objectives, status, schedule, and document organization.

Section 2 Related Documentation - Provides a bibliography of reference documents for the IRD organized by parent, applicable, and information subsections.

Section 3 Systems Description - Provides an overview of both systems and a discussion of the system components involved in the interface and the functional descriptions of the interfaces. An overview diagram depicting the functional interfaces is also included.

Section 4 Data Flow Descriptions- Provides a discussion of how message traffic and input/output data will flow through the ECS/DASCE interfaces from an operational point of view. A context diagram depicting the data flows is included.

Section 5 Functional and Performance Interface Requirements - Requirements are sorted for presentation by denoting functional type. Traceability to parent documents is also noted in this section.

Section 6 Interface Control Documentation Plan - Identifies and summarizes the ICD(s) that will be derived from this IRD.

Appendix A DAS Output Data Products and Product Sizes

Appendix B Data Volumes

Appendix C Requirements Traceability

Abbreviations and Acronyms

2. Related Documentation

2.1 Parent Documents

The following documents are the parents from which this document's scope and content derive:

193-208-SE1-001	Methodology for Definition of External Interfaces for the ECS Project
210-TP-001-006	Technical Baseline for the ECS Project
NHB 2410.9A	NASA Handbook: Automated Information Security
NMI 2410.7B	NASA Management Instruction: Assuring the Security and Integrity of NASA Information Resources
423-10-01-0	Goddard Space Flight Center, Earth Science Data and Information System (ESDIS) Level 2 Requirements EOSDIS Core System (ECS), Volume 0; February 18, 1993
423-41-01	Goddard Space Flight Center, EOSDIS Core System Statement of Work; May 21, 1993
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the EOSDIS Core System; June 2, 1994
none	Goddard Space Flight Center, Memorandum of Understanding Between the Data Assimilation Office and ESDIS Project; June 26, 1996
Circular A-130	Office of Management and Budget (OMB), Office of the President of the United States

2.2 Applicable Documents

The following documents are directly applicable to this document. In the event of conflict between any of these documents and this document, this document shall take precedence.

301-CD-002-003	System Implementation Plan for the ECS Project
305-CD-025-002	Release B SDPS Ingest Subsystem Design Specification for the ECS Project
305-CD-030-002	Release B GSFC DAAC Design Specification for the ECS Project
311-CD-002-004	Science Data Processing Segment (SDPS) Database Design and Database Schema Specifications for the ECS Project

221-TP-001-002	Process Vs. Store Assessment Technical Paper [Prepared for Workshop to Review the USGCRP and MTPE/EOS]
none	Data Assimilation Computing and Mass Storage Requirements for 1998 (known as the DAO "Ops Concept") January 17, 1996

2.3 Information Documents

The following documents, although not directly applicable, amplify or clarify the information presented in this document, but are not binding.

194-201-SE1-001	Systems Engineering Plan for the ECS Project
194-202-SE1-001	ECS Standards and Procedures for the ECS Project
604-CD-002-003	Operations Concept for the ECS Project: Part 2B -- ECS Release B
175-WP-001-001	HDF-EOS Primer for Version 1 EOSDIS (White Paper for the ECS Project)
505-41-12	Goddard Space Flight Center, Interface Requirements Document between ECS and Science Computing Facilities, May 1995

3. System Descriptions

3.1 ECS - DAS Project Relationship Overview

The ECS project and the DAO work together to define the functional and performance interfaces required between the ECS and the DASCE. The discussions on the interfaces is centered around two distinct data flow channels: first, that subset of the total DAS input data that are obtained from the ECS through the DRP element of the DASCE and second, the ingest, archive, and distribution by the ECS of the standard DAS products generated by the Operations and Reanalysis modes of the DAS. Figure 3-1 illustrates the top-level view of the ECS/DASCE interface. Sections 3.2 and 3.3 of this document provide high level descriptions of the ECS and the DASCE.

ECS engineering provides consultation to DAO personnel for resolving DAS/ECS interface issues and to facilitate implementation of the interface. ECS also provides technical assistance on all ECS developed and maintained interface software (e.g. SDP Toolkit usage, HDF-EOS format). ECS performs the necessary engineering work to ensure proper EOSDIS architecture to meet the requirements for handling the input and output data that are identified in the previous paragraph. During deployment, ESDIS manages the Integration and Test (I&T) and configuration management of the ECS/DAS interface with support from the ECS Project and the DAO.

3.2 EOSDIS Core System (ECS)

The ECS is a distributed component of the EOSDIS. In addition to fully supporting the EOS series of satellites, the ECS provides information management, data processing, data archive and distribution functions for other NASA Earth science flight missions, NASA instruments flown on non-NASA spacecraft, and for other NASA held Earth science data.

3.2.1 ECS Segments

ECS is composed of three segments defined to support three major operational areas: flight operations, science data processing, and communications/system management. The ECS segments are described below:

a. The Flight Operations Segment (FOS) manages and controls the EOS spacecraft and instruments. The FOS includes the EOS Operations Center (EOC), which is responsible for mission planning, scheduling, controlling, monitoring, and data analysis in support of mission operations for U.S. EOS spacecraft and instruments. The Flight Operations Segment has no interface with DASCE and, therefore, is not applicable to this IRD.

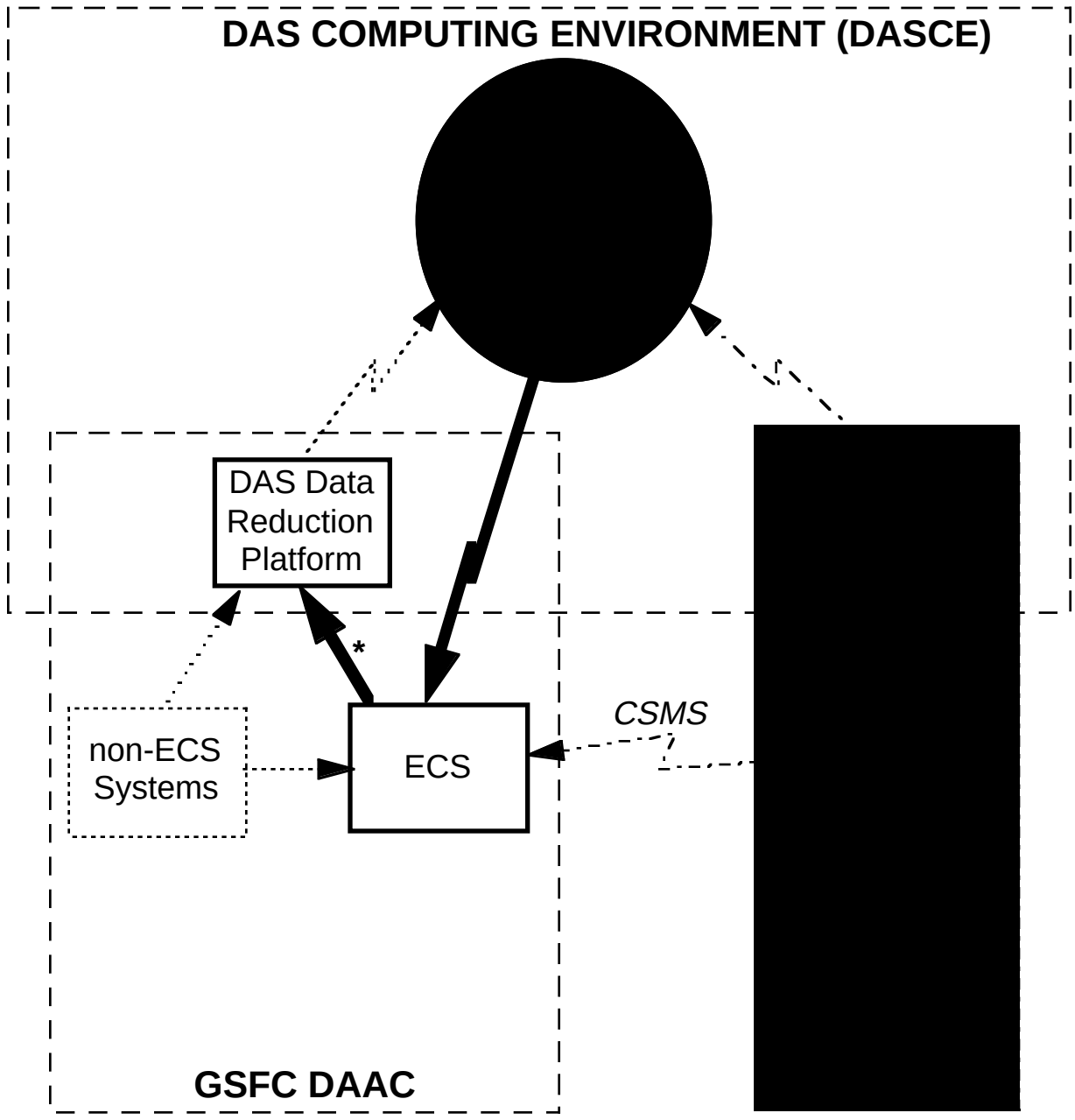

Figure 3-1. Top-Level View of ECS/DAS Interface

b. The Science Data Processing Segment (SDPS) provides a set of ingest, processing, archive, and distribution services for science data and a data information system for the entire EOSDIS. The SDPS processes data from the EOS instruments to data products. The SDPS also provides short- and long-term storage for EOS, other Earth observing missions, and other related data, software, and results, and distributes the data to EOSDIS users. The SDPS contains a distributed data and information management function and user services suite for the ECS, including a catalog system in support of user data selection and ordering for Instrument Teams, including the DAS, during Operations and Reanalysis modes. Since DAO is an Instrument Team, DAS interface receives the same level of priority service from ECS as any other Instrument Team interfaces. The following list reflects current plans for the distribution of SDPS elements at different Distributed Active Archive Centers (DAACs):

1. Langley Research Center (LaRC), Hampton, Virginia
2. Goddard Space Flight Center (GSFC), Greenbelt, Maryland
3. Earth Resources Observation System (EROS) Data Center (EDC), Sioux Falls, South Dakota
4. Jet Propulsion Laboratory (JPL), Pasadena, California
5. University of Colorado, National Snow and Ice Data Center (NSIDC), Boulder, Colorado
6. University of Alaska, Alaska Synthetic Aperture Radar (SAR) Facility (ASF), Fairbanks, Alaska[1]
7. Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee[1, 3]
8. Socioeconomic Data and Applications Center (SEDAC), Saginaw, Michigan[1, 2]

Notes: [1]These DAACs have no ECS-provided product generation capability.

[2]The ECS will provide no hardware or operations support to the SEDAC but will make ECS software available for reuse.

[3]The ECS will provide hardware and software to ORNL, but will not be responsible for operational support and hardware maintenance.

In the event the DAO places DRPs in the DAAC facilities currently not supported by ECS processing, separate IRDs or their equivalent will be prepared to document these interfaces.

c. The Communications and System Management Segment (CSMS) provides overall ECS management of ECS ground system resources and communications/networking services internally to ECS. CSMS provides the ECS Local Area Networks (LANs) at each of the DAACs and the EOC to support ECS operations and interfaces with the DAO provided network connection (TBD), NASA Science Internet (NSI), and site Campus LANs. The CSMS System Monitoring and Coordination Center (SMC), along with local system management capabilities at DAAC sites and the EOC, provides system management services for ECS ground system resources.

3.2.2 ECS and the DAACs

The Release B GSFC DAAC Design Specification for the ECS Project (Document Number 305-CD-030-002) describes the architecture of the GSFC DAAC. Currently identified as the GSFC V0 DAAC, the GSFC DAAC operates multiple systems, including ECS. The ECS at GSFC DAAC will interface with the DASCE element located at NASA Ames for ingesting products generated by DAS. This ingested data will be archived by ECS at the GSFC DAAC.

DASCE interfaces with ECS to acquire DAS input that is available in the ECS archives. DASCE also receives DAS input data from the GSFC DAAC. The data that DAS retrieves from the ECS go through the normal distribution channels that are available to all other Instrument Teams. The DRP allows reduction in data volume by preprocessing of the data. In the operations mode where real time data acquisitions are essential, this allows DAO to make cost effective use of the network bandwidth.

For input to DAS, this IRD establishes requirements for ONLY the data path that goes through the DRP. The DRPs, when used, are physically located at the DAACs even though they are logically part of the DASCE. DRPs are desktop workstations and are procured as Commercial-Off-The-Shelf (COTS) systems by the DAO.

For sending out it's products, the DASCE has one interface with the ECS located at the GSFC DAAC. This IRD establishes requirements for the interface protocol for facilitating this data transfer. Even though an integral part of the logical path, the DAO provided network connection (TBD) that provides linkage between ECS and DASCE is outside the scope of this IRD.

3.3 DAS Project Background

The DAS project consists of a set of executable programs that run on a variety of computing platforms. The source code is mostly FORTRAN (90). The DAS workload is concentrated on the Analysis module and the General Circulation Model (GCM) module. The performance profile of the modules categorizes the DAS as a High Performance Computing (HPC) application.

The DAO is responsible for developing assimilation algorithms used to produce research-quality assimilated data products like the multiyear global atmospheric data sets. The input source data for all DAS modes are 1) the First Look Input Data (FLID) and 2) measurements from different EOS instruments. FLID includes, but not limited to, radiosondes, surface (land and ship), buoys, aircraft and satellite winds, and NESDIS TOVS retrievals and retrieval spot radiances. The output consists of large sets of gridded data in the global scope at fixed (usually 3 or 6 hours) time intervals. ECS, located at the GSFC DAAC, archives the DAS generated products provided by DASCE, and makes it available to the end-users and instrument teams.

DAS performs pre-processing and post-processing using DAO provided software. The DAS submits subscriptions to ECS for any new data based on its availability. ECS notifies the DAS of data availability, storage status, and error conditions as it monitors data transfer between the ECS and the DAS. DAS data requests are automated.

3.3.1 Data Assimilation System

The DASCE supports different processing modes. Potentially, the first step in each of these modes is for the DAS to spatially reduce the Instrument Team data. In some cases the reduction factor is in the thousands. To minimize network traffic across a WAN, it is efficient to perform this data reduction by the DRP located at the GSFC DAAC and other DAACs if needed. In addition to the hardware platform, the DRP has attached disks to stage the data retrieved from the ECS. In the following paragraphs, a high level description of the DAS processing modes is provided.

3.3.1.1 Operations Mode

The Operations mode of DAS consists of both real-time and delayed processing. DAS, in its Real-time Operations mode, uses the FLID and generates the First Look Analysis and 10-Day Forecast products. These products are generated on a real-time basis, meaning that the products are generated within a specific time window each day. DAS does NOT pull any data out of the ECS archives for these two product generation runs but provides the products for ECS at the GSFC DAAC to archive and distribute. The FLID is obtained from the GSFC DAAC.

In the Delayed Operations mode, DAS runs the Final Platform analysis to generate the Final Platform products. DAS, in addition to FLID, uses EOS data for this run. Final Platform Analysis is referred to as Delayed Operations mode since two asynchronous activities have to be completed before it can run. First, the First Look Analysis and 10-Day Forecast by DAS has to be completed and the resultant products have to be made available to other Instrument Teams. Second, the Instrument Teams have to complete their processing and any resultant products needed are obtained by the DAS to create the Final Platform (reference Goddard Space Flight Center, Interface Requirements Document between ECS and Science Computing Facilities, May 1995, document number 505-41-12).

3.3.1.2 Reanalysis Mode

In Reanalysis mode, the DAS sweeps through massive amounts of input data, a large amount of which are archived by the ECS at the GSFC DAAC. During a given 24 hour period, up to 30 days worth of data may be retrieved (machine-to-machine interface) to be reprocessed. The throughput rates are, therefore, much higher compared to the Operations mode. In Reanalysis mode, like in Operations, DAS accepts FLID and EOS data as input and generates Off-line Analysis, Pocket Analysis, and 20 Year Analysis products. Products from the Reanalysis are archived by ECS at the GSFC DAAC. Table B-1 in Appendix B shows the data rates.

3.3.1.3 Scientific Development Mode

In Scientific Development mode the DAS processes EOS and FLID data. For this mode, the DAO is just another ECS end user with no unusual priorities.

3.3.2 Data Assimilation System Computing Environment

The DASCE is comprised of a set of algorithms, their software embodiment, network and connection (TBD), and hardware host; developed, operated and managed by the DAO. The DAS code is executed in a physically distributed computing environment designed, purchased, and maintained by the DAO. A majority of the processors in this computing environment reside at NASA Ames. Even though the DRP is part of the DASCE, it resides at the GSFC DAAC (and other DAACs if needed). The connection between the DASCE equipment located at NASA Ames and ECS, as well as that between DASCE elements at NASA Ames and DRP, use the DAO provided network connection (TBD).

4. Data Flow Descriptions

4.1 Overview

Figure 4-1 depicts the data flows between the ECS and the DASCE. The operational context of each of these data flows is presented in the following sections. Input occurs at the DRPs, within the DASCE, located at the GSFC DAAC and other DAACs if needed. Output occurs at the GSFC DAAC.

4.2 Message and Data Exchange

After the DASCE completes generation of products, a message and data transfer operation is initiated. Authentication and authorization is implemented by ECS for the pull of DAS products from the DASCE by ECS. ECS ingests and archives the DAS products at the GSFC DAAC.

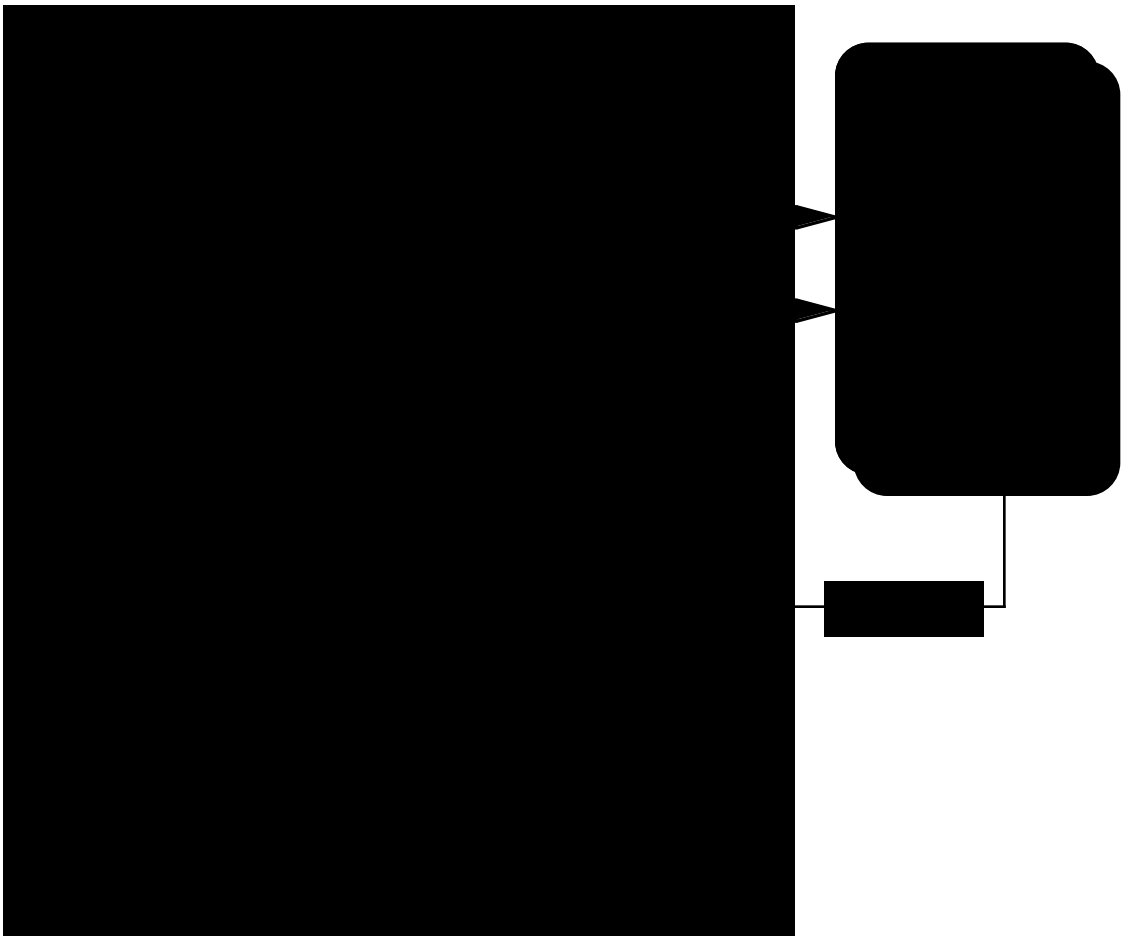

Figure 4-1. Data Flows Between ECS and the DASCE

Upon successful receipt by ECS, an acknowledgment message is sent by ECS to the DASCE as part of the message and data transfer scenario. If a problem occurs during the data transfer, an acknowledgment message is sent to the DASCE notifying the system with an error message.

4.3 DAS Input Exchange Data Flows

The interface between the DRPs, within the DASCE, and ECS is identical to any other EOSDIS data user interface. Processing priorities allow Instrument Teams to deliver their data in a timely fashion, in accordance with ECS performance requirements. This allows the DAO Reanalysis and Operations workload to be finished as specified in the Data Assimilation Computing and Mass Storage Requirements for 1998 (known as the DAO "Ops Concept").

4.4 Data Flow Conditions

DAS data products are considered completely processed when the DAS has completed executing and a DAO Quality Assurance program is performed on the datasets, metadata and headers. Data remains available within the DASCE for a period of 72 hours, or as determined by the DAO, in case re-transmission is requested in response to an ECS initiated message.

4.5 Data Formats

Products generated by DAS comply with the HDF-EOS standard used by ECS. This format allows the users of the DAS products to utilize various functionality available in ECS. The DAS products must also comply with the "Cooperative Ocean/Atmosphere Research Data Service" (COARDS) conventions, which will make DAO’s data sets accessible to a broad segment of the meteorological/oceanographic scientific community. The COARDS conventions are transparent to ECS functions and therefore do not interfere with them.

5. Functional and Performance Interface Requirements

5.1 Requirements Overview

The functional and performance interface requirements identified in this document are traced to the Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System and the Memorandum of Understanding Between the Data Assimilation Office and ESDIS Project. Appendix C, Table C-1 of this document provides a listing of each IRD requirement by requirement number and an identification of its parent requirements as found in this document.

The following sections present the functional interface requirements for the ECS to DAS interface. All requirements use electronic computer controlled processes unless otherwise specified.

5.2 Message and Data Requirements

DAS0010 DASCE shall have the capability to provide, and ECS at GSFC DAAC shall have the capability to receive, notification of data availability using an agreed protocol.

DAS0020 ECS at GSFC DAAC shall have the capability to provide, and DASCE shall have the capability to receive, acknowledgments of receipt of file transfers using an agreed protocol.

DAS0030 ECS at GSFC DAAC shall have the capability to provide, and DASCE shall have the capability to receive acknowledgments, of errors during file transfers using an agreed protocol.

DAS0040 DASCE shall have the capability to provide, and ECS at GSFC DAAC shall have the capability to acquire, archive and distribute, DAS Standard Product data, and associated metadata in HDF-EOS standard format.

DAS0050 ECS shall make available to the DASCE non-EOSDIS data that is common to multiple EOS Standard Data Product producers.

DAS0060 ECS shall make EOS products available to the DAS.

5.3 Security Requirements

The systems and network involved in the DASCE to ECS interface are required to meet the minimum requirements directed by the Computer Security Act of 1987, the Office of Management and Budget (OMB) Circular A-130 and NASA implementing directives NASA Management Instruction (NMI) 2410.7B and NASA Handbook (NHB) 2410.9A. The sensitivity of the ECS system has been determined to be Sensitivity Level 2.

The ESDIS Security Policy in regards to file transfer is summarized as follows:

Writing to the ECS archive requires a strongly authenticated, e.g., kerberos or Distributed Computing Environment (DCE), client. In this application ECS is polling the DASCE.

DAS1010 DASCE shall have the capability to interface with ECS at the GSFC DAAC using an agreed upon authorization and authentication protocol.

DAS1020 ECS at the GSFC DAAC shall have the capability to interface with DASCE using an agreed upon authorization and authentication protocol.

5.4 Data Volume and Rate

DAS2010 The ECS within the GSFC DAAC shall have the capacity to support the data volumes and rates as defined in Appendix A and B of this document.

6. Interface Control Documentation Plan

The planned ICD, which corresponds to this IRD, is entitled Interface Control Document Between EOSDIS Core System and Data Assimilation System (DAS) Project. This ICD will define the functional and physical design of the two interfaces between ECS and the DAS, and will include the precise data contents, format and protocol of each interface. All modes (options) of data exchange for each interface will be described as well as the conditions required for each mode or option. Additionally, data rates, duty cycles, error conditions, and error handling procedures will be included. The sequence of exchanges will be completely described (e.g., required handshaking.) Communications protocols or physical media will be detailed for each interface. The ICD Between ECS and Data Assimilation System (DAS) Project will be controlled by ESDIS and DAO Configuration Control Boards. Development of this ICD is the responsibility of the ECS contractor.

The ECS/DAS interfaces are currently scheduled for implementation in ECS Release B. The delivery plan for the ICD Between ECS and the DAS Project is as follows:

a. ECS will deliver a preliminary ICD in late April 1997. This ICD will contain preliminary definitions for the ECS/DAS interfaces.

b. ECS will deliver a final ICD in late May 1997. This ICD will be placed under configuration control by the applicable CCBs.

It is expected that the ECS and DAS personnel will work together closely in the development of this ICD. The ICD plan presented in this document details only the formal deliveries; it is expected that additional informal reviews and information exchanges will occur, as necessary, during the ICD development process.

Any future ECS/DAS Project ICDs will be addressed in updates to the ICD.

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Appendix A. Data Products and Product Sizes

Tables A-1 through A-5 in this Appendix show the product groups and the rate of output data to be passed from the DASCE to ECS at the GSFC DAAC. The data rate is based on 32 bit data.

The input data rate from ECS to DASCE at the DAACs will be determined by future discussions and working groups. The input data rate details will be recorded in the ECS/DAS ICD.

Long term storage estimates, which depends upon the data volume per year, will be addressed in the ECS/DAO ICD, also. The yearly data volume depends upon how often the DAO generates Reanalysis products.

Table A-1. First Look Analysis Major Product Groups

AHWGP Name	Data Rate (MBs)/day*		File Description
	2.0 x 2.5	1.0 x 1.0 (1999)	
DAS_FLK_ANALYSIS (HDF-EOS format)	838.0	4190.0	DAS First Look Analysis Product produced for AM-1 Instrument Teams to use in their retrievals
DAS_FLK_10DAY_FORECAST (HDF-EOS format)	3894	19470.0	10 Day Forecast Product to validate DAS products
DAS_FLK_10DAY_Forecast_Archive (HDF-EOS format)	338	1690.0	10 Day Forecast Product to validate DAS products (Certain products to be archived over time)
DAS_TRMM_AM1_ANALYSIS (HDF-EOS format)	100	500.0	Analysis products for TRMM and AM-1 Instruments to do their retrievals
DAS_FLK_RESTART_FILE	149.4	747	Archived to redo First Look Analysis
DAS_OBS_FILE_FSTLK	50.0		Aggregate product of all data used in this analysis

* 1 day of data assimilation per 1 calendar day.

Table A-2. Final Platform Analysis Major Product Groups

AHWGP Name	Data Rate (MBs)/day*		File Description
	2.0 x 2.5	1.0 x 1.0 (1999)	
DAS_FNLPLTFM_PRODUCT (HDF-EOS format)	588.0	2940.0	Final Platform Analysis Product (using AM-1 and other satellite data)
DAS_FNLPLTFM_RESTART_FILE	149.4	747.0	Archived to redo Final Platform Analysis
DAS_OBS_FILE_FNLPLTFM	5.0		Aggregate product of all data used in this analysis

* 1 day of data assimilation per 1 calendar day.

Table A-3. Pocket Analysis Major Product Groups

AHWGP Name	Data Rate (MBs)/day*		File Description
	2.0 x 2.5	1.0 x 1.0 (1999)	
DAS_POCKET_ANALYSIS _PRODUCT (HDF-EOS format)	25140.0	125700	Pocket Analysis Product (Using AM-1 and other Satellite Data)
DAS_POCKET_RESTART_FILE	149.4	747.0	Archived to redo any of the Pocket Analysis. Only saved once per 30 days of assimilation
DAS_OBS_FILE_PCKT_ANALYS	1500.0		Aggregate product of all data used in this analysis

* 30 days of data assimilation per 1 calendar day. Assume only 1 of 3 Reanalysis Modes running at a time.

Table A-4. Long Term Re-Analysis Major Product Groups

AHWGP Name	Data Rate (MBs)/day*		File Description
	2.0 x 2.5	1.0 x 1.0 (1999)	
DAS_REANALYSIS_PRODUCT (HDF-EOS format)	25140.0	125700	Long Term Reanalysis Product of the DAO (Using AM-1 and other satellite data)
DAS_REANALYSIS_RESTART_FILE	149.4	747.0	Archived to redo a Reanalysis for up to 20 years. Only saved once per 30 days of assimilation
DAS_OBS_FILE_REANALYSIS	1500.0		Aggregate product of all data used in this analysis

* 30 days of data assimilation per 1 calendar day. Assume only 1 of 3 Reanalysis Modes running at a time.

Table A-5. Off-Line Re-Analysis Major Product Groups (2.0 Degrees latitude x 2.5 degrees longitude horizontal resolution)

AHWGP Name	Data Rate (MBs)/day		File Description
	2.0 x 2.5	1.0 x 1.0 (1999)	
DAS_OFFLINE_REANALYSIS_PRODUCT (HDF-EOS format)	2514.0	12570.0	DAO's Off-line Reanalysis Product (Using AM-1 and other Satellite Data)
DAS_OFFLINE_RESTART_FILE	149.4	747.0	Archived to redo any of the Off-line Reanalysis. Only saved once per 30 days of assimilation
DAS_OBS_FILE_OFLN_REANALYSIS	1500.0		Aggregate product of all data used in this analysis

* 30 days of data assimilation per 1 calendar day. Assume only 1 of 3 Reanalysis Modes running at a time.

Note: The naming convention of the products listed in the appendix were used for the Ad Hoc Working Group on Production (AHWGP) effort and may not be the actual product names used by DAO and/or ECS when the products are actually generated.

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Appendix B. Data Volumes

The following estimated Data Volumes were provided by the DAS Project and are noted in the Data Assimilation System Computing and Mass Storage Requirements for 1998 (known as the DAO "Ops Concept"). The additional table, Table B-2 DAS Input and Output Data Transfer Requirements, provides additional clarification about ECS/DAS data transfer.

The figures below for DASCE output rates assume data product subsetting is provided. If for any reason subsetting is not successfully performed by ECS on DAS data products, the total output data rates will be least doubled for those products.

Table B-1. DAS Resource Requirements

Input to DRP from ECS (GSFC DAAC, or other DAACs if needed)	DAS Mode	Output from DAS (NASA Ames) to ECS (GSFC DAAC) (based on 2.0 x 2.5)
2.0 GB/Day	Operations	5.8 GB/Day
8 GB/Day	Reanalysis	26.6 GB/Day*
60.0 GB/Day	Scientific Development	5.0 GB/Day
Operations Break Down		
1.0 GB/Day	(1) First Look Analysis	1.1 GB/Day
1.0 MB/Day	(2) 10-Day Forecast	3.9 GB/Day
1.0 GB/Day	(3) Final Platform Analysis	0.8 GB/Day
Reanalysis Break Down		
8 GB/Day from GSFC (This estimate is the average data rate for all of the Re-analysis related PGEs)	(1) 20-Year Reanalysis (2) Off-line Reanalysis (3) Pocket Reanalysis	26.6 GB/Day 4.0 GB/Day 26.6 GB/Day

* Assume only 1 of 3 Reanalysis Modes running at a time

Table B-2. DAS Input and Output Data Transfer Requirements

		INPUT FROM DAACs	INPUT FROM ECS	OUTPUT TO GSFC ECS
		FLID	**EOS DATA**	**DAO PRODUCT DATA SETS**
Operations Mode	First Look	A	N	A
	10 Day Forecast	N	N	A
	Final Platform	A	A	A
Reanalysis Mode	20 Year Reanalysis	A	S	A
	Off-Line Analysis	A	S	S
	Pocket Analysis	A	S	A
Scientific Development Mode	Any of above	A	S	S

A = Always, S = Sometimes, N = Never

Appendix C. Requirements Traceability

Table C-1. Requirements Traceability

ECS/DAS IRD Requirements	Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System
DAS0010	EOSD 1608
DAS0020	SDPS0080, DADS 1070, DADS 1380, DADS 1400
DAS0030	SDPS0080, DADS 1070, DADS 1380, DADS 1400
DAS0040	EOSD 1608, DADS 0170, SDPS 0020,
DAS0050	SDPS0080, SDPS0050
DAS0060	SDPS0080, SDPS0050
DAS1010	EOSD 1990, EOSD 2440, EOSD 2620, EOSD 2660
DAS1020	EOSD 1990, EOSD 2440, EOSD 2620, EOSD 2660
DAS2010	EOSD 1608, DADS0170, SDPS0020

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Appendix D. Work-off Plan for ECS-DAS IRD

Table D-1. Work-off Plan for ECS-DAS IRD

IRD Issue #	IRD Para. #	Issue Priority	IRD Issue Type & Description	Work-off Plan Task(s)	Projected Resolution Date	Risk Assessment**
1	1.2, 3.2.1c, 3.2.2, 3.3.2	B	DAO provided network connection	DAO will provide information	5/96	Needed for completion of Physical/Datalink Layer Protocols definition

* Issue Priority Categories:

A = Design impact; e.g., an unresolved interface.

B = Minimal design impact; e.g., content or format of a specific field unresolved.

C = No design impact - administrative detail; e.g., reference document number is not available.

** Risk Assessment Definition: 2 - Risk if issue is not resolved by projected resolution date

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Abbreviations and Acronyms

B router	Internet Bridge Router combination
CCB	Configuration Control Board
CDRL	Contract Data Requirements List
COARDS	Cooperative Ocean/Atmosphere Research Data Service
COTS	Commercial Off-the-Shelf
DAAC	Distributed Active Archive Center
DAO	Data Assimilation Office
DAS	Data Assimilation System
DASCE	Data Assimilation System Computing Environment
DCE	Distributed Computing Environment
DID	Data Item Description
DRP	Data Reduction Platform
DCN	Document Change Notice
ECS	EOSDIS Core System
EDOS	EOS Data and Operations System
EOC	EOS Operations Center
EOS	Earth Observing System
EOSDIS	EOS Data and Information System
ESDIS	Earth Science Data and Information System
FLID	First Look Input Data
GSFC	Goddard Space Flight Center
HDF	Hierarchical Data Format
ICD	Interface Control Document
IRD	Interface Requirements Document
ISO	International Standards Organization
LAN	Local Area Network
MOU	Memoranda of Understanding
NASA	National Aeronautical and Space Administration

Nascom	NASA Communications
QA	Quality Assurance
QC	Quality Control
SCF	Science Computing Facility
SMC	System Monitoring and Coordination Center
TBD	To Be Determined
WAN	Wide Area Network